SECTION III

DESIGN CRITERIA FOR WATER PROJECTS

GENERAL

The following are the minimum Standard Design Criteria that must be met for all water improvements in order to meet the requirements of 30 TAC Chapter 290, Sections 290.38 through 290.47, the City of Fort Worth Ordinance #7234 (Subdivision Ordinance), and the City of Fort Worth Policy for the Installation of Community Facilities, also to be approved for incorporation into the Fort Worth Water System.

1. AVERAGE DAY WATER USE: 215 gallons per capita per day (GPCD)

2. MAXIMUM DAY: For "Maximum day" unrestricted use, multiply the annual Average day by 2.25

3. MAXIMUM HOUR: For the "Maximum Hour" unrestricted use, multiply the maximum day by 2.00

4. POPULATION DENSITY: 18 persons per acre

5. PERSONS PER RESIDENTIAL CONNECTION: 3.5 people/connection

6. HEAD LOSS: Maximum rate of head loss due to friction in a water main should not exceed 5-7 feet/thousand feet.

7. FIRE FLOW: Fire flow should be rated at 1,000 gallons per minute (GPM) in residential areas. Fire flow for commercial and industrial areas should be a minimum of 1,500 GPM or per current Fire Code requirements.

8. DESIGN SIZE: Water mains should be sized to meet Maximum Hour or Maximum Day plus Fire Flow, whichever is greater. However, no pipe size shall be less than 8-inch.

9. COMPUTIONS:

$$\text{Maximum Day/Connection} = \frac{(2.25)(215\ \text{GPCD})(3.5\ \text{p/c})}{1{,}000{,}000} = 0.00169\ \text{MGD}$$

Maximum Hour/Connection = (2.00)(0.00169 MGD) = 0.00338 MGD

10. SUPPLY STORAGE VERSUS PUMPING: The maximum hour demand should be supplied with not less than 60% from pumping capacity and not more than 40% from available "elevated" storage.

11. ELEVATED STORAGE DEPLETION: Elevated water storage should be maintained not less than 33% full during maximum hour demand period.

12. PIPE CLASS VERSUS PRESSURE: Refer to the Fort Worth Water Department General Contract Documents and General Specifications.

13. QUICK CLOSING VALVES: Quick-closing valves will not be permitted in any water facility connected to the Fort Worth Water System.

14. MINIMUM WORKING PRESSURE: In residential areas, the working pressure in mains shall not be less than 35 p.s.i. as specified in the TNRCC's regulations.

PRESSURE PLANE AREAS

The City is divided into pressure plane areas designated as follows:

1. HOLLY PLANE: The central area of the City, which is served from the Holly Water Treatment Plants directly, without re-pumping, which lies below ground elevation 640'. The storage overflow is 760'.

2. SOUTH SIDE II PLANE: The area south and south west of the Holly Plane between the ground elevations of 640' and 720'. The storage overflow elevation is 850'.

3. SOUTH SIDE III PLANE: The area south and south west of the Southside II Plane between the ground elevations of 720' and 860'. The storage overflow elevation is 990'.

4. SOUTH SIDE IV PLANE (Projected): The projected area south of the Southside III plane above ground elevation of 860'. The storage overflow elevation is projected to be 1075'.

5. WEST SIDE II PLANE: The area west of the Holly Plane between ground elevation 640' and 730'. The storage overflow is 857'.

6. WEST SIDE III PLANE: The area west of the West Side II Plane between the ground elevations of 730' and 840'. The storage overflow elevation is 975'.

7. WEST SIDE IV PLANE: The projected area west of the West Side III Plane above ground elevation of 840'. The storage overflow elevation is projected to be 1075'.

8. NORTH SIDE II PLANE: The area north, northwest, and northeast of the Holly Plane between ground elevations of 640’ and 730’. The storage overflow elevation is 853’.

9. NORTHSIDE III PLANE: The area north and northwest of the North Side II Plane between the ground elevations of 730’ and 830’. The current storage overflow elevation is 936’, the future overflow elevation will be 950’.

10. EAST SIDE II PLANE: The area east of the Holly Plane area between ground elevation 640’ and 680’. The storage overflow elevation is 805’. This plane also includes the area east of IH-35 and north of Holly Plane.

DESIGN CRITERIA

1. Minimum Water Line Size: The following design criteria shall be considered to be the minimum basis for sizing water lines in various locations to be incorporated into the Fort Worth Water distribution system:

   A. Residential Water Service: The minimum size residential water service line for new residential development shall be 1-inch.

      A 1-inch water service with two ¾-inch meters (commonly called a "bullhead" connection) can be installed for residential duplex lots or for contiguous single family residential lots having a front footage of 40 feet or less.

   B. Residential & Commercial Water Lines: The minimum water main size for a residential (defined as "single-family" detached or two-family/duplex housing) area or a commercial (defined as development not composed of "single-family" detached or two-family/duplex housing and industrial developments) area is eight (8) inches (I.D.), or such larger size as may be necessary to properly serve the proposed and existing development.

   C. Industrial Water Lines: The minimum water main size for a industrial area is twelve (12) inches (I.D.), or such larger size as may be necessary to properly serve the proposed and existing development.

2. Sizing Water Mains

   A. Industrial Areas: For large industrial sites or areas, water mains will be sized to meet projected demand for both industrial requirements and fire coverage.

   B. Multi-Family Demand: Peak demand for multi-family development shall be determined on the basis of not less that that required under the following formula published in June 1967, AWWA Journal.

      $$Q = U + 15\sqrt{U}$$

      Where: U is equal to the number of apartment units
      Q is equal to Water Demand in GPM (gallons per minute)

   C. Fire Flow Requirements: In addition to the normal maximum hour water service requirements, full consideration shall be given to fire flow requirements as superimposed upon the maximum day demand conditions, elevation, and the type of development proposed, in arriving at the final water main capacity.

D. Fire Flow Demands: Fire flow should be rated at 1,000 gallons per minute (GPM) in residential areas. Fire flow for commercial and industrial areas should be a minimum of 1500 GPM or per current Fire Code requirements.

3. Water Main Location: The following design criteria shall be considered to be the normal locations for water mains in the Fort Worth Water distribution system:

A. Residential Water Service: The normal location of the residential water service shall be in the parkway in front of the property and five (5) feet east or north of the center of the property frontage.

B. Normal Water Main Location: The normal location of water mains shall be 5 feet off North or East property line (either existing or proposed).

C. Water Mains on Divided Thoroughfares or Wide Paved Street: To prevent cutting the pavement on divided thoroughfares and wide paved streets (greater than 60 LF) a double main system may be used. The capacity of the two parallel water mains shall not be less than the required capacity of a single line designed to serve the area.

D. "Services" Crossing Divided Thoroughfares or Wide Paved Streets: When the proposed water service requires crossing over half of divided thoroughfare (either existing or proposed) or across more than 40 linear feet (perpendicular to street center line) of street pavement (either existing or proposed), the proposed service shall be made as a public water main extension in order to meet all the requirements of this section.

4. Valve Location & Requirements: The following design criteria shall be considered to be the standard locations and requirements for valves in the Fort Worth Water distribution system.

A. Fire Hydrants: All fire hydrants leads shall have a gate valve (min 6-inch) and anchor tee.

B. Valves: Unless approved by the Water Department, only approved gate valves will be used in the distribution system.

C. Isolation Valves: Valves shall be located to allow isolation of specific section of the distribution system to prevent shutting off more than once, services those customers who are served by water lines outside. Usually this will be a water main under a street between two cross streets. Water valves are usually located in street intersections or at water line crosses or tees. The location of valves should be approved by the Water Department.

D. Transmission Mains: All water line connections (water services, mains etc.) shall have a gate valve at connections to a water transmission line.

E. Vaults for 16-inch Valves & Larger: All valves that are 16-inches or larger shall be in a valve vault. A Corporation and curb stop shall be provided on each side of the valve (no more than 12-inches from the valve). Corporation and curb stop shall be 1-inch for 16-inch through 24-inch water pipe and shall be 2-inch for 30-inch and larger water pipe.

F. By-Pass for 16-inch Gate Valves and Larger: All 16-inch Gate Valves or larger, shall have a bypass valve, unless approved by the Water Department.

5. Fire Hydrant Location: The following design criteria shall be considered to be the normal locations for fire hydrants in the Fort Worth Water distribution system. Only approved national standard three-way 6-inch fire hydrants with threads that match fire hydrants in use by the Fort Worth Fire Department will be allowed: Fire Hydrant locations should be reviewed by the Fire Prevention Bureau of the Fort Worth Fire Department :

A. Maximum Distance from Fire Hydrants:

(1) One and Two Family Residences: For all one and two family residences, fire hydrants must be installed within (or along) a 500 foot radius along a direct horizontal line from residence, and must be within 800 feet "hose lay" using the most direct route of access between fire hydrant and building.

(2) Other Land Uses: For all other land uses, fire hydrants must be installed within (or along) a 300 foot radius along a direct horizontal line from building, and must be within 500 feet "hose lay" using the most direct route of access between fire hydrant and building.

B. Cul-de-Sacs: Streets longer than 300 feet, which end in a cul-de-sac, must have a fire hydrant in the cul-de-sac. When the cul-de-sac is less than 300 feet from the center of the connecting street intersection, a fire hydrant is required at the connecting street intersection.

C. Street Location: All fire hydrants must be installed at least two and one half (2-1/2) feet, but less than nine (9) feet, from the back of the curb of the paved street or edge of a designated approved fire lane. Normal location is three (3) feet behind the curb. Location for fire hydrant should be selected to provide shortest possible lead under street pavement.

D. Ground Elevation: The ground line on the fire hydrant in a standard installation shall be set even with the elevation of the top of the adjacent existing or proposed curb (elevation specified). When parkways are to be developed with a rolling or irregular slope, the ground line index on the fire hydrant shall be set to the proposed ground elevation (specified) at the point of installation.

E. Private Fire Hydrant: Where the fire hydrant is on a metered line, fire hydrant must be maintained by Owner and not obstructed. Paint in red color to differentiate from public fire hydrant (aluminum).

F. Siamese Connection: Siamese connection must be within 50 feet of a fire hydrant.

6. Fire Lines: The following design criteria shall be considered to be the normal requirements for fire lines in the Fort Worth Water distribution system. All projects requiring fire lines shall be presented to the Bureau of Fire Prevention (Fort Worth Fire Department) for review:

   A. Double Detector Check Valve: All fire lines are required to have a double gate double detector check valve assembly. The double detector check valve and vault is to be located on private property (Appendix H - Backflow Protection).

   B. Siamese Connection: When Siamese connection is required, it must be located on the discharge (customer) side of the meter.

   C. Fire Line Testing: The Bureau of Fire Prevention (Fort Worth Fire Department) is responsible for inspection and testing of all fire lines on owner side of meter, gate valve, or back flow preventor.

7. Pressure Regulators: In low areas where pressures may exceed 80 psi, builders and plumbers should be advised that in such locations pressure reducing devices should be installed in accordance with the current Plumbing Code adopted by the City of Fort Worth. Pressure reducing valves will not be installed in the public water system.

8. Air Release & Vacuum Relief Combination Valves: Combination air and vacuum relief valves shall be installed in high points along feeder mains, transmission mains or major mains to exhaust trapped air or relief vacuum from the water distribution system. The size and type are as follows:

Water Line Size	Size of Relief Valve	Type of Relief Valve
16-inch & Smaller	1-inch	Combination
18-inch to 36-inch	2-inch	Combination
42-inch and above	3-inch	Combination

These combination relief valves shall be installed in vaults per the General Contract Documents and General Specifications

9. Blow-off Valves & Vaults: In low points along transmission lines (16-inch and larger), blow-off valves and vaults shall be required in the system to drain the mains. The sizes generally are :

Size of Water Main	Size of Blow-off
16-inch and Below	4-inch
18inch to 42-inch	6-inch
48-inch and above	8-inch

10. Clean Out Wyes: In strategic locations along lateral water lines, water feeder mains, water transmission mains, etc., cleaning wyes shall be provided for passing "Cleaning Pigs" through the water line to sweep trash, dirt and debris from the pipe. These wyes shall be supplemented with chlorination and sampling points, as required for disinfecting of the water main. The Development Engineer will approve location of these wyes (chlorination and sampling points).

11. Water Sample Stations: Water sample stations are required to meet regulatory requirements. These stations may be installed at the request of the City at major intersections, water transmission line tees/crosses, large water meters, or other locations to be designated by the Water Department.

12. Back Flow Prevention Devices: All service connections to the Fort Worth Water Distribution System shall have a back flow prevention device (see Exhibit 1 and 2).

13. Meters Larger than 2-Inches In Size: Water meters that are larger that 2-inches in size shall have the following:

    A. Meter Vault: Meter shall be installed in a vault.

    B. Bypass: All meters larger than 2-inches shall have a bypass in accordance with Exhibit in Appendix H.

    C. Type of Meter: All meters larger than 2-inch shall be a combination meter (large and small meter).

    D. Purchase: All meters shall be purchased from the Water Department.